

EXAMPLES OF UNDULATING CONDUITS

Figure 1.

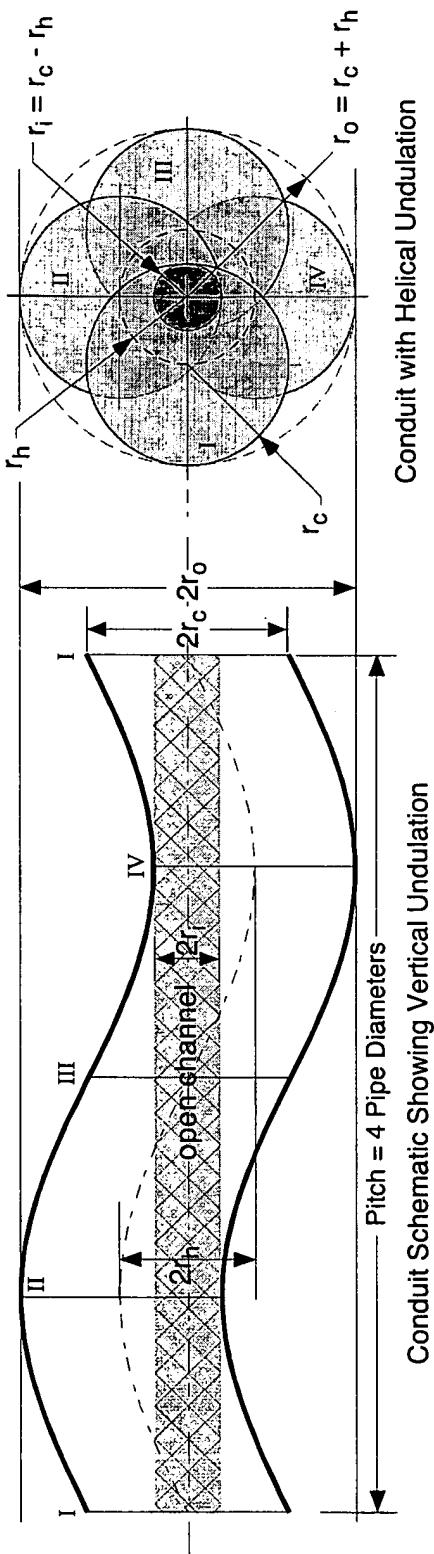
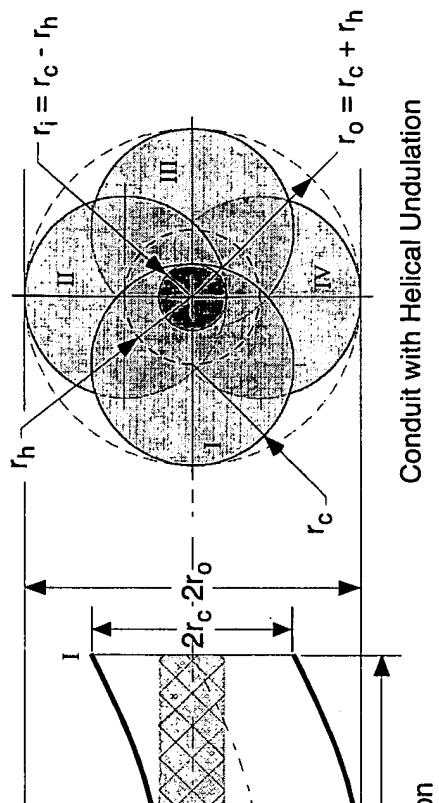


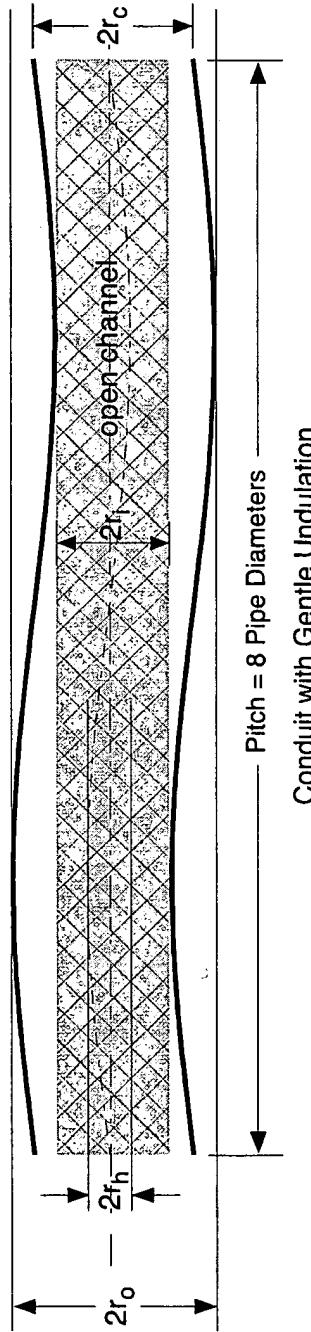
Figure 2.



Conduit Schematic Showing Vertical Undulation
Conduit with Helical Undulation

r_c = radius of conduit
 r_h = radius of helical path of conduit centerline
 $r_o = r_c + r_h$ = outer radius of conduit helix
 $r_i = r_c - r_h$ = radius of open interior channel ($r_c \geq r_h$)
 $= r_h - r_c$ = inner radius of conduit helix ($r_c < r_h$)

Figure 3.



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Fig. 4a

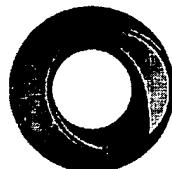


Fig. 4b

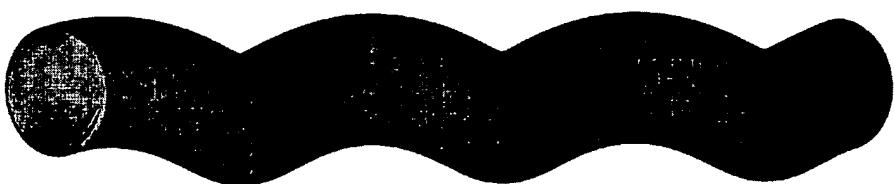
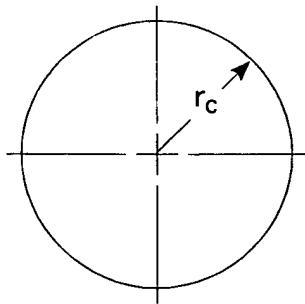


Fig. 4c

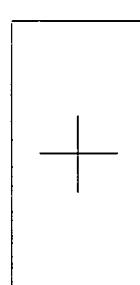
Figure 4. End and Oblique Views of a Short Section of Helical Undulating Conduit Having a Circular Cross-Section and Open Center Channel

Fig. 5a



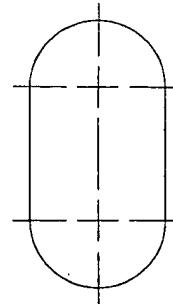
Circle

Fig. 5b



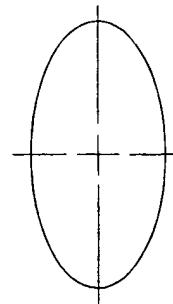
Polygon
(4 sides)

Fig. 5c



Composite
(round-end polygon)

Fig. 5d



Ellipse

Figure 5. Some Cross-Sectional Shapes for Undulating Conduits

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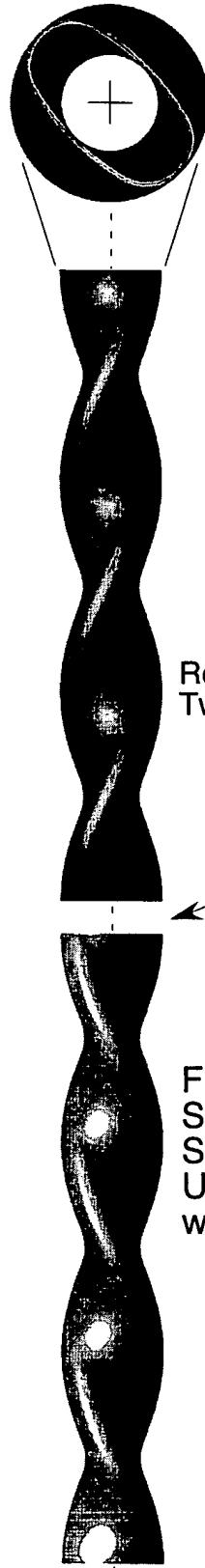


Fig. 6a
Side View of
Spiral-Twisted
Undulating Conduit
with Oval Cross-Section

Conduit
Transition Connectors
Not Shown

Reversed
Twist

Fig. 6c
Trimetric View of
Undulating Conduit
'Flow Revitalizer' Insert
Between Round
Pipe Sections



Figure 6. Examples
of Spiral-Twisted
Undulating Conduit

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Figure 7
Use Of Undulating Conduit Hydrodynamic Mixers In A Bitumen Extraction Circuit

